Our Community's Place Among the Stars

Think About It Date

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- As you stargaze, what do you notice about the stars? Do some stars appear brighter than others? Larger or smaller? What about their colors?

WHAT DO YOU THINK?

Activity 7
Our Community's Place Among the Stars

Investigate Part B Date

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1a. What does the vertical axis represent?

1b. What does the horizontal axis represent?

1c. What is the temperature and luminosity of the sun?

1d. Put four more dots on the diagram labeled A through D to show the locations of stars that are:

a. Hot and bright
b. Hot and dim
c. Cool and dim
d. Cool and bright

2a. Plot the locations of the stars from Table 1.

3. Classify each of the stars.

Star	Type of Star
Sirius A	Main sequence
Arcturus	
Vega	
Capella	
Rigel	
Procyon A	
Betelgeuse	
Altair	
Aldebaran	
Spica	
Pollux	
Deneb	
Procyon B	
Sirius B	

Activity 7

Digging Deeper Date

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Stars vary in temperature and brightness

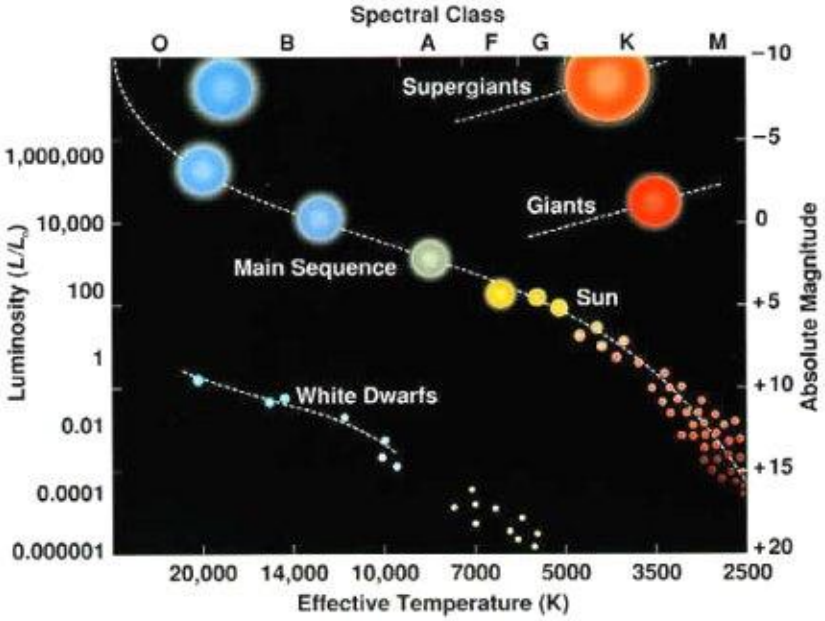
Star's classification depends on the color and temperature of the star

Stellar Classification	Temperature (kelvins)
O	25,000 K and higher
B	11,000–25,000 K
A	7500–11,000 K
F	6000–7500 K
G	5000–6000 K
K	3500–5000 K
M	less than 3500 K

Luminosity describes the brightness of a star

HR diagram a diagram that shows the relationship between a star's brightness and temperature

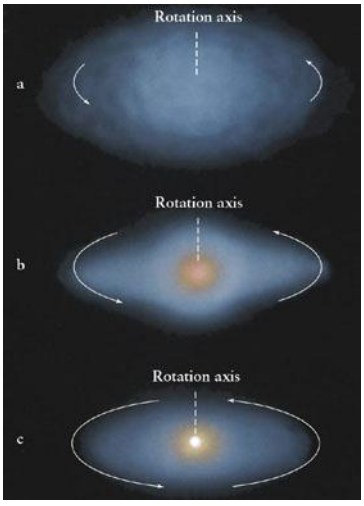
Temperature is plotted across the bottom, and luminosity is plotted up one side



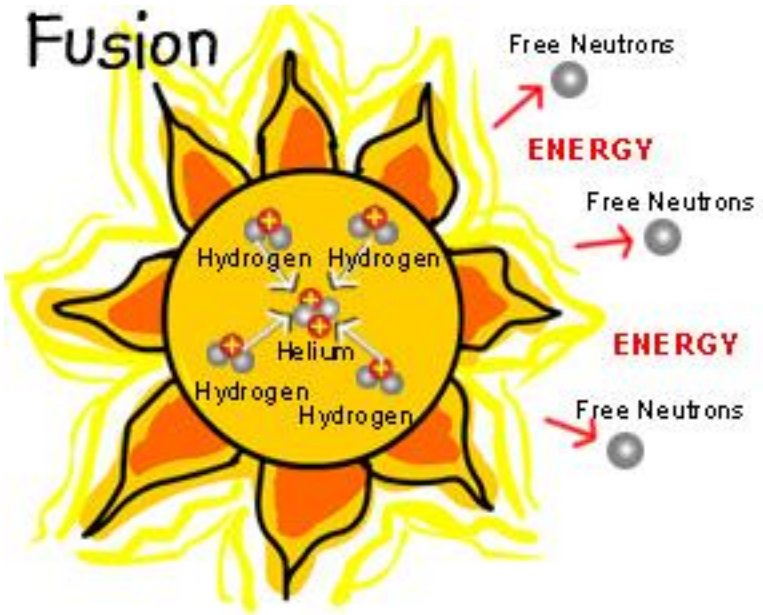
Birth of a star

1. formation of a cloud of gas and dust
2. the material in the cloud is clumped, mixed, and swirled
3. the core begins to heat up
4. when the temperature reaches 15 million Kelvins, fusion reactions begin
5. the energy released spreads into space, and a star is born

http://www.brainpop.com/science/space/lifecycleofstars/



Fusion	four hydrogen atoms fuse together to make one helium atom in a star's core Some mass is "lost" in the reaction, because one helium atom has less mass than four hydrogen atoms This "lost" mass is changed into energy that is released by the sun



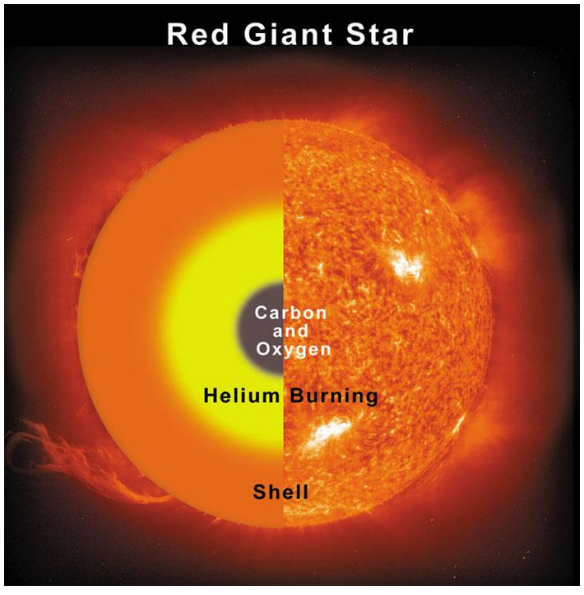
http://www.youtube.com/watch?v=EO9CPO3CBF0

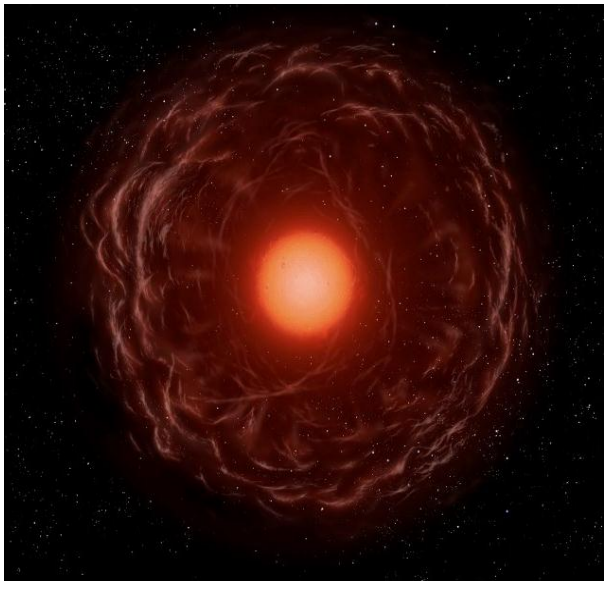
http://www.atomicarchive.com/Fusion/FusionMov.shtml

Main sequence	a star that uses hydrogen as its fuel

	Main sequence stars fit into a diagonal band that runs from the upper left to the lower right of the H-R diagram
	Many stars spend 90% of their lifetime on the main sequence
Our sun	has a main sequence life span of about 10 billion years (it is now 5 billion years old)
Star's lifespan	depend on its mass
Example	•our sun will live about 10 billion years •small, cooler stars live twice as long •massive, supergiant stars consume their mass too quickly only live a few tens of million of years •very hot stars go through their fuel very quickly

Hydrogen depletion	when the hydrogen in the star runs out, there is no longer a balance between pressure (from fusion) and gravity The core contracts, and temperatures inside the star increase The outer layers of the star expand and cool The star now uses helium as fuel in its core
Giant (red giant)	a star whose core has run out of hydrogen and is now using helium, causing its outer layers to expand and cool Giant stars are bright, but not hot (near the upper right corner of HR diagram)





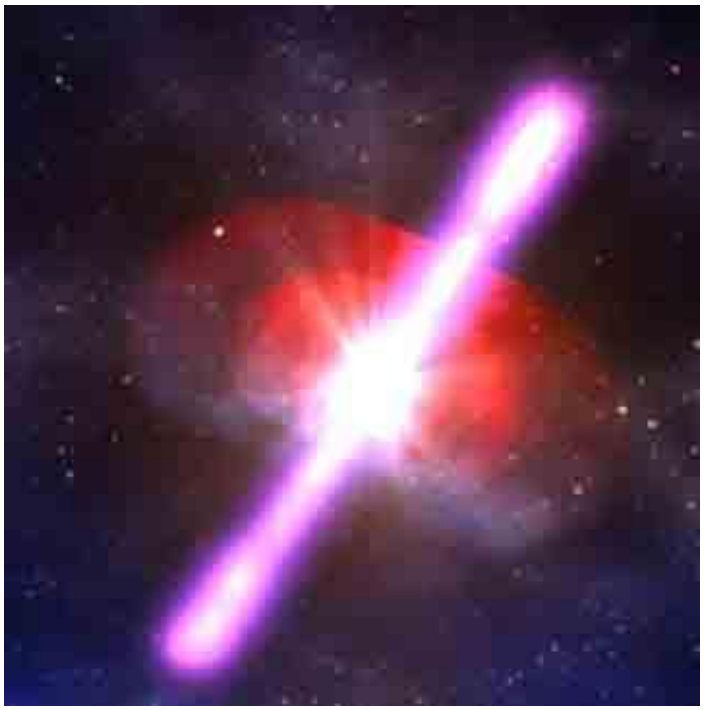
http://www.youtube.com/watch?v=fOM7DMxOiAk

100 million K	after the core of the giant reaches this temperature, helium is converted to carbon The star expands to an enormous size, and its outer layers are much cooler
Our sun	will become a giant in about 5 billion years
White dwarf	a star that forms after much of the helium is used up, causing the star's core to contract even more, and its outer layers escape into space All that remains is the hot, dense core White dwarfs are very hot, but not bright (lower left corner of HR diagram)

http://whitedwarf.org/education/sunwd/index.html

Massive stars	in stars that are 8 times more massive than the sun, the stages of evolution are faster and more violent
Supergiant	a late stage in the life cycle of a massive star, when the core heats to higher temperatures, and heavier elements form by fusion The star continues to expand Iron forms in the core, and fusion can no longer occur The core collapses violently and a shockwave travels outward through the star

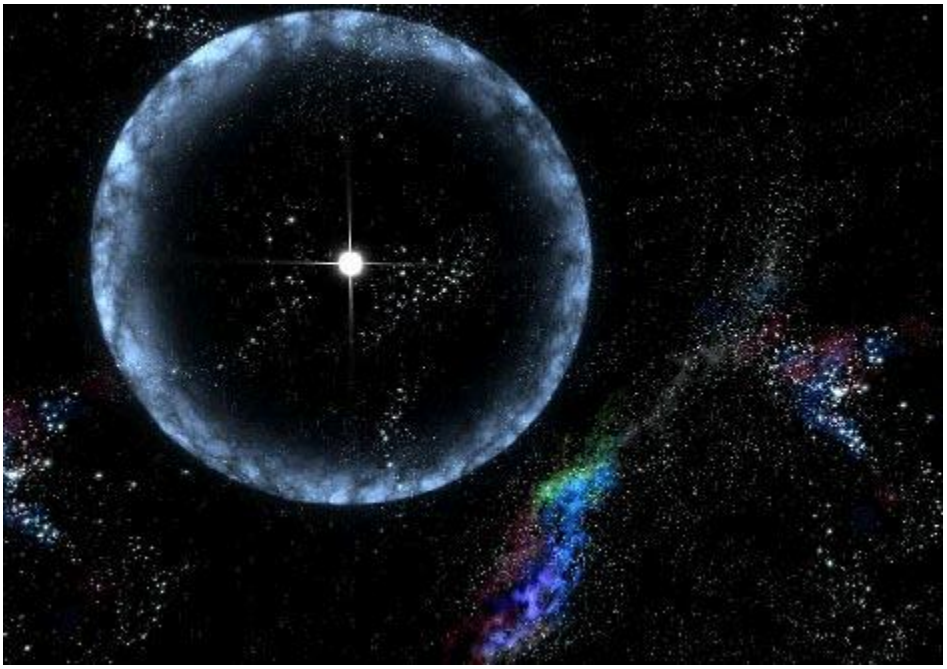
Supernova — the outer portion of the star explodes, producing a supernova



http://chandra.harvard.edu/resources/animations/sn_explosion_lg_web.mpg

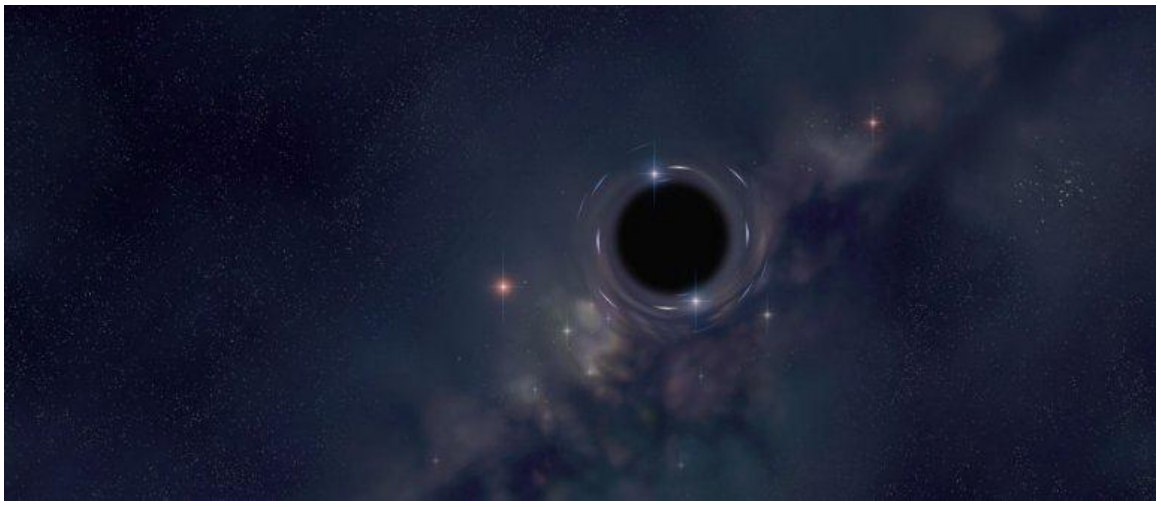
http://www.nasa.gov/mpg/69478main_classic_supernova.mpg

Neutron star — the collapsed, dense core of a supernova that contains only neutrons



Stellar black hole the leftover core of a massive star after a supernova

Black holes create such a large gravitational pull that not even light can escape



http://www.brainpop.com/science/space/blackholes/

http://www.windows.ucar.edu/cool_stuff/movies/black_hole.qt

Activity 7

Check Your Understanding Date

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1. How do astronomers classify stars?

2. Write a brief outline of how stars are born.

3. What determines the way a star dies?